

DEPARTMENT OF CONSUMER & INDUSTRY SERVICES

DIRECTOR'S OFFICE

GENERAL INDUSTRY SAFETY STANDARDS

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(By authority conferred on the director of the department of consumer and industry services by sections 16 and 21 of Act
No. 154 of the Public Acts of 1974, as amended, and Executive Reorganization Order No. 1996-2, being §§408.1016,
408.1021, and 445.2001 of the Michigan Compiled Laws)

R 408.11916 is Rescinded.

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PART 19. CRAWLER, LOCOMOTIVE AND TRUCK CRANES

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GENERAL PROVISIONS

R 408.11901. Scope.

Rule 1901. This part applies for the safe construction and maintenance of crawler, locomotive and truck cranes including mobile hydraulic cranes, used only as lifting cranes, by the employer and their safe use by the employee in, around and about a place of employment. Railway cranes on public right of ways for clearing wrecks are excluded.

R 408.11903. Definitions B and C.

Rule 1903. (1) "Boom" means a structural member hinged at the lower end to a fixed location and used for supporting hoisting tackle.

(2) "Boom angle" means the acute angle between the longitudinal center line of the boom and the horizontal.

(3) "Boom stop" means a device used to limit the angle of the boom at the highest position.

(4) "Crawler crane" means a rotating superstructure with a power plant, operating machinery and boom mounted on a base equipped with crawler treads for travel, and used for hoisting and swinging loads.

R 408.11904. Definitions J to R.

Rule 1904. (1) "Jib" means an extension attached to a boom point to provide added boom length for lifting a specific

load. A jib may be in line with the boom or offset to various angles.

(2) "Load rating" means the rating in pounds established by the manufacturer in conjunction with rule 1923 and is dependent on such factors as anchorage, structural competence, rope strength and hoist capacity.

(3) "Locomotive crane" means a rotating superstructure with a power plant, operating machinery and boom mounted on a base or car equipped for travel on a railroad track. It may be self-propelled or propelled by an outside source.

(4) "Mobile hydraulic crane" means a crane using a hydraulic means of powering some of the basic crane functions.

(5) "Reeving" means a rope system in which the rope travels around drums and sheaves.

R 408.11905. Definitions S.

Rule 1905. (1) "Safety factor" means the ratio of the breaking strength of a piece of material or object to the maximum designed load or stress applied when in use.

(2) "Side loading" means a load applied at an angle to the vertical plane of the boom.

(3) "Standby" means not to be in regular service, but used intermittently or occasionally as required.

(4) "Standing rope" means a supporting rope which maintains a constant distance between points of attachment to the 2 components connected by the rope.

(5) "Structural competence" means the ability of a machine and its components to withstand the stresses imposed by applied loads.

(6) "Swing" means the rotation of a mast or boom for movement of loads in a horizontal direction about the axis of rotation.

R 408.11906. Definitions T to W.

Rule 1906. (1) "Truck crane" means a rotating superstructure with a power plant, operating machinery and a boom mounted on an automotive truck equipped with a power plant for travel.

(2) "Whipline" means a separate or auxiliary hoist rope system of lighter load capacity and higher speed than provided by the main hoist.

(3) "Winch head" means a power driven spool for handling of a load by means of friction between fiber or wire rope and the spool.

R 408.11911. Employer responsibilities.

Rule 1911. (1) An employer shall limit the use of a crawler, locomotive or truck crane to:

- (a) An employee who has been trained and qualified to operate the type crane to which he or she is assigned.
- (b) A learner under the direct supervision of a designated employee.
- (c) Authorized maintenance personnel during the performance of their duties.

(2) An employer shall maintain a crane and its accessories in a condition which will not endanger an operator or other employees.

(3) An employer shall limit the use of a crane to its maximum rated capacity.

R 408.11912. Employee responsibilities.

Rule 1912. (1) An employee, except a learner, shall pass a qualification test including items in rule 1915 before operating a crane.

(2) An operator shall report any defects of a crane to his or her supervisor.

(3) An unauthorized employee shall not enter a crane cab.

(4) An unauthorized employee shall not ride on any exterior part of a crane.

R 408.11913. Operator selection.

Rule 1913. (1) An employee selected to operate a crawler, locomotive or truck crane shall meet the following requirements:

- (a) Have corrected vision that meets the same requirements as vision for a valid Michigan driver's license. Possession of a Michigan driver's license or a doctor's certificate is evidence of meeting this requirement.
- (b) Have effective use of all 4 limbs.
- (c) Be of a height sufficient to operate the controls and to have an unobstructed view over the controls into the work area.
- (d) Have coordination between eyes, hands, and feet.
- (e) Be free of known convulsive disorders and episodes of unconsciousness.
- (f) Be able to hear and understand conversational levels of sound in an ordinary office environment.
- (g) Be able to read and understand signs, labels, and instruction manuals.

(2) An employee assigned to operate a crawler, locomotive, or truck crane shall have his or her ability to meet the minimum requirements in this rule verified not less than every 3 years.

(3) The requirements of this rule, except subrule (1)(e) of this rule, may be waived for an existing employee operating a crawler, locomotive, or truck crane, on the effective date of this part, who has demonstrated his or her ability to perform the duties in a safe manner.

R 408.11914. Operator training.

Rule 1914. An employer shall provide training to a prospective crane operator prior to assignment as an operator of a crane. Instruction shall include:

- (a) Capabilities of the equipment and attachments.
- (b) Purpose, use and limitations of the controls.
- (c) How to make daily inspections of the equipment.
- (d) Practice in operating assigned equipment through the functions necessary to perform the job.
- (e) A review of state standards, company rules and regulations applicable to crane operation.

R 408.11915. Operator testing.

Rule 1915. An employer shall determine the ability of an employee before authorizing the employee to operate a crane. This determination shall be based on the employee's:

- (a) Operating ability.
- (b) Knowledge of the equipment.
- (c) Knowledge of state standards, company rules and regulations applicable to crane operation.
- (d) Knowledge of daily inspections of the equipment.

R 408.11916 Rescinded.

CONSTRUCTION

R 408.11921. Construction; standards.

Rule 1921. (1) A crawler, locomotive or truck crane, purchased or modified after the effective date of this part, shall be as prescribed in Chapter 501 and Section 5-2.2 of Chapter 5-2, USAS B30.5-1968, Crawler, Locomotive and Truck Cranes, which are incorporated herein by reference and which are available for inspection at the Lansing office of the department of consumer and industry services. These standards may be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018, or from the Michigan Department of Consumer and Industry Services, State Secondary Complex, 7150 Harris Drive, Box 30643, Lansing, Michigan 48909, at a cost of \$3.00 each.

(2) A mobile hydraulic crane purchased or modified after the effective date of this part shall be as prescribed in Chapter 15-1 and Section 15-2.2 of Chapter 15-2, ANSI B30.15-1973, Mobile Hydraulic Cranes, which are incorporated herein by reference and which are available for inspection at the Lansing office of the department of consumer and industry services. These standards may be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018, or from the Michigan Department of Consumer and Industry Services, State Secondary Complex, 7150 Harris Drive, Box 30643, Lansing, Michigan 48909, at a cost of \$4.50 each.

(3) A crawler, locomotive, or truck crane purchased after August 31, 1971, shall be modified to conform to Chapter 5 and Section 5-2.2 of Chapter 5-2 of the USAS standard, B30.5-1968, Crawler, Locomotive, and Truck Cranes or Chapter 15-1 and Section 15-2.2 of Chapter 15-2 of ANSI standard, B30.15-1973, Mobile Hydraulic Cranes.

R 408.11923. Rating charts.

Rule 1923. (1) A legible rating chart shall be provided at the operator station showing not less than the following information for crawler, locomotive or truck cranes:

- (a) Load capacity relating to corresponding boom angles and operating radii for all boom lengths, jib lengths and angles. Where optional equipment, such as outriggers or extra counterweights are provided by the manufacturer, alternate ratings shall be provided in addition.
- (b) Where structural competence limits the ratings, such information shall be shown on the chart.
- (2) The required parts of line for hoist reeving, including the size and construction of rope shall be on the rating chart or in the operating manual.

R 408.11924. Ballast and counterweights.

Rule 1924. A crane shall not be operated with more than the designed amount of ballast or counterweight. The amount of ballast or counterweight shall not be changed without authorization of the manufacturer in writing and making corresponding changes in the rating chart prescribed in rule 1923.

OPERATION

R 408.11931. Operating practices, general.

Rule 1931. (1) An operator shall respond to signals only from the designated signalman using appropriate signals, except where voice communications equipment is used. (See figure 1). An operator shall obey a stop signal from anyone.

(2) A crane shall be equipped with an audible signaling device which shall be actuated before traveling and intermittently during travel when approaching an employee. When moving a crane, the following signals shall be used:

- (a) Stop, 1 audible signal.
- (b) Go ahead, 2 audible signals.
- (c) Back up, 3 audible signals.

(3) An operator is responsible for those operations under his control. Whenever there is doubt as to safety, he shall stop operations until safety is assured.

(4) An operator shall not close a switch or start an engine if there is a warning sign or tag on the starting controls until the sign or tag has been removed by the employee placing it or removed by an authorized employee after making sure the hazard is removed. Before closing a switch or starting an engine, an operator shall see that all controls are in the off position and all employees are in the clear.

(5) If power fails during operation, the operator shall:

- (a) Set all brakes and locking devices.
- (b) Move all clutches and other power controls to the off or neutral position unless such action would create an unsafe condition.
- (c) If practicable, land any suspended load under brake control.

(6) An operator shall test all controls at the start of a shift. Needed adjustments shall be made before operations begin.

R 408.11932. Operating practices.

Rule 1932. (1) An operator shall not leave a crawler, locomotive or truck crane unattended until:

- (a) Any attached load, bucket, lifting magnet or other device is landed.
- (b) The master clutch is disengaged.
- (c) The travel, swing and boom brakes and other locking devices are set.
- (d) The clutch controls are in the off or neutral position unless such action would create an unsafe condition.
- (e) The engine is stopped.
- (f) The crane is secured against accidental travel.

(2) When assembling or disassembling a boom on the ground, it shall be blocked to prevent dropping the boom and boom sections.

(3) When a boom section is manually telescoped it shall be positioned so that through and through pinning of the

cylinder eye may be accomplished and shall be checked in a horizontal position.

(4) When 2 or more cranes are used to lift a single load, 1 designated employee shall direct the rigging, lift and movement.

(5) A locomotive crane shall not be rotated into a position where other rail cars on an adjacent track might strike it, except where it has been ascertained that cars are not moving on the adjacent track and flag protection has been provided.

(6) Specified tire pressures shall be maintained.

R 408.11933. Attaching and holding a load.

Rule 1933. (1) A load shall be attached to the hook by means of a sling or other lifting device. The hoist rope shall not be wrapped around a load except when setting or removing a pole.

(2) Before starting to hoist, the operator shall make sure:

- (a) The hoist rope is not kinked.
- (b) The multiple part lines are not twisted around each other.
- (c) The hook is not swinging when brought over the load.
- (3) An employee shall not be permitted to pass or stand under a suspended load.

(4) An operator shall not load a crane beyond the rated load. A load which is limited by structural competence rather than by stability shall be checked by the operator to determine that the weight does not exceed the rated load.

R 408.11934. Moving a load.

Rule 1934. (1) In moving a load, an operator shall avoid sudden acceleration and deceleration of a movement of the boom which would cause a swinging action by the load.

(2) An operator shall not move a load or hook if an employee is on it.

(3) A load shall be secured and balanced before it is lifted more than 6 inches.

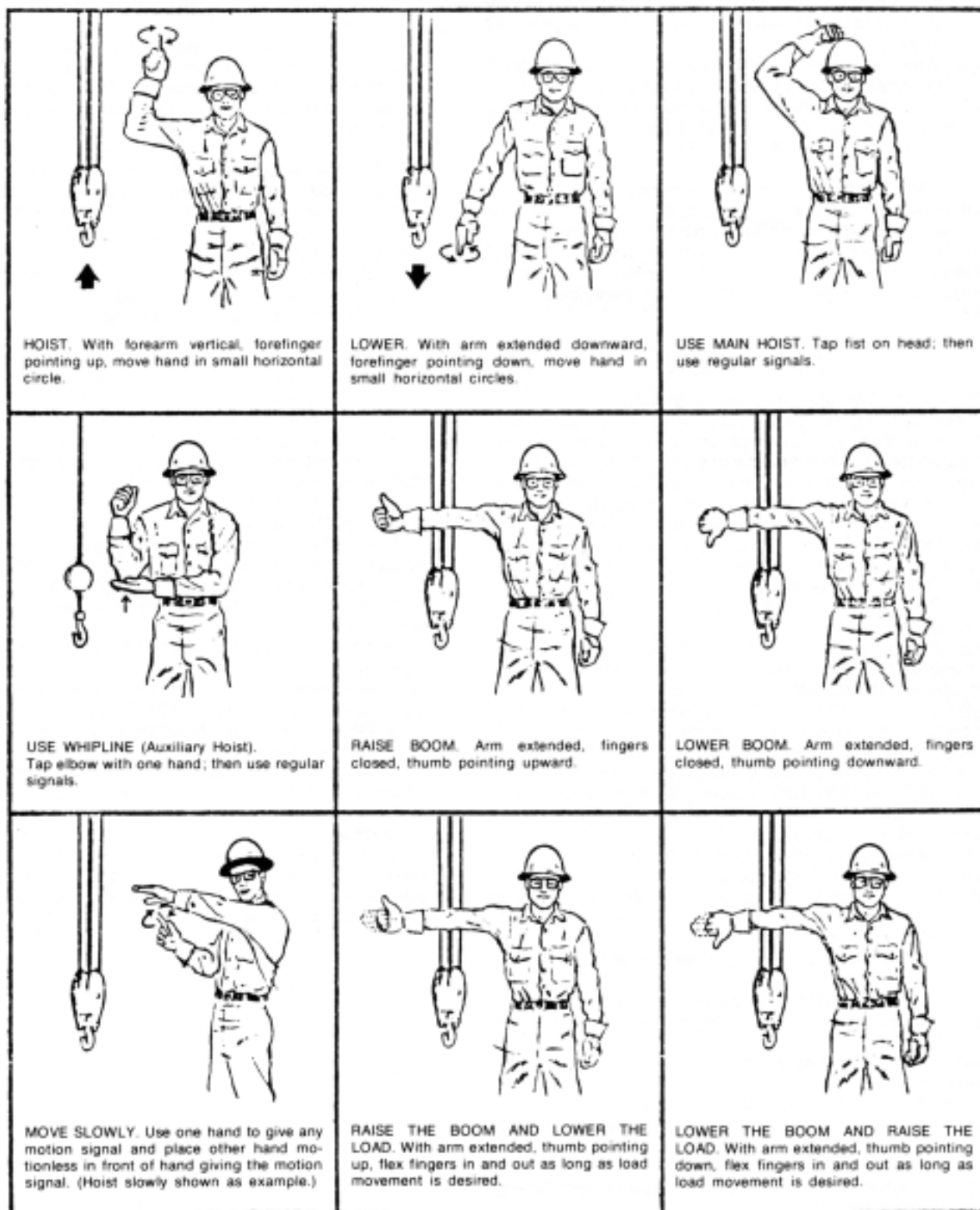
(4) An operator shall test the hoisting brakes before moving a near rated load by raising the load a few inches and applying the hoisting brakes. This requirement applies to both single or multiple line reeving.

(5) A load or boom shall not be lowered below a point where less than 2 full wraps of rope remain on the drum.

(6) A load shall not be moved in a manner to contact obstructions.

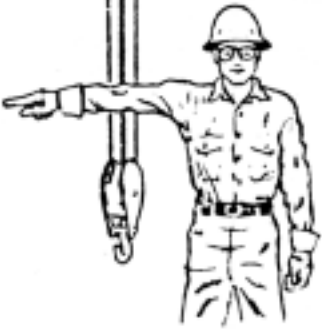


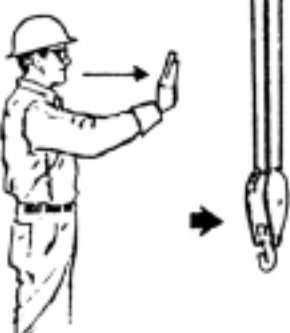





(7) The rotational speed of a crane shall be such that the center of the load does not swing out beyond the radius of the point sheave in use. A tag line shall be used when rotation of the load would be hazardous.

FIGURE 1



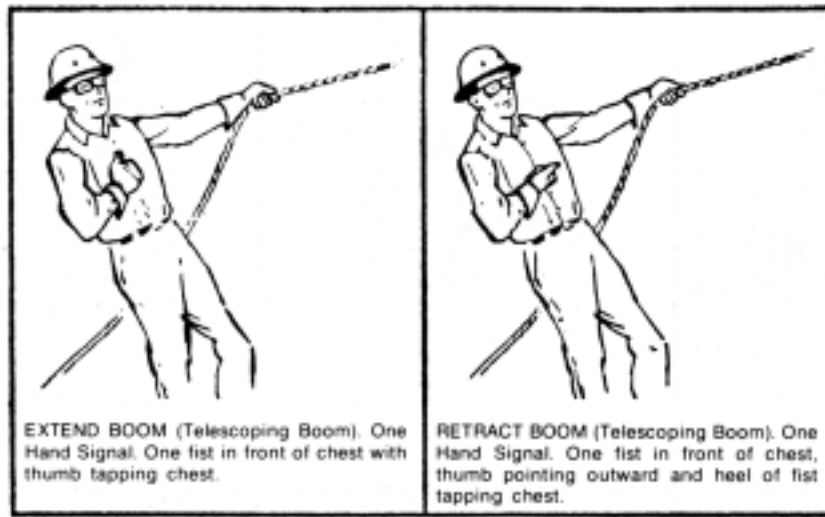
STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS

FIGURE 1 (cont.)

 <p>SWING. Arm extended, point with finger in direction of swing of boom.</p>	 <p>STOP. Arm extended, palm down, hold position rigidly.</p>	 <p>EMERGENCY STOP. Arm extended, palm down, move hand rapidly right and left.</p>
 <p>TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.</p>	 <p>DOG EVERYTHING. Clasp hands in front of body.</p>	 <p>TRAVEL. (Both Tracks). Use both fists in front of body, making a circular motion about each other, indicating direction of travel, forward or backward (For crawler cranes only.)</p>
 <p>TRAVEL. (One Track). Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For crawler cranes only.)</p>	 <p>EXTEND BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing outward.</p>	 <p>RETRACT BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing toward each other.</p>

STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS

FIGURE 1 (cont.)



STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS

R 408.11935. Moving a load.

Rule 1935. (1) A crane shall not be used for dragging a load sideways.

(2) A load shall not be lifted over the front area of a truck crane, unless it is within the capacity of the rating chart for the front area of the truck crane.

(3) Floats or pads secured to outriggers shall be used when the load to be handled at a particular radius exceeds the rated load without outriggers (see rule 1923). A wood block used to support an outrigger shall be:

- (a) Of such size as to prevent shifting and toppling of the load.
- (b) Of such strength to resist crushing.
- (c) Free of defects such as knots and cracks which could effect its ability to support the load.

(4) Before lifting a load with a locomotive crane not using outriggers, a means shall be provided to prevent carrying the load on the truck springs. Rail clamps shall not be used to restrain a locomotive crane from tipping.

(5) Before moving with a load, a designated employee shall determine:

- (a) Position to carry the load.
- (b) Boom location.
- (c) Ground conditions.
- (d) Travel route.
- (e) Speed of movement.
- (f) Location of overhead wires.

(6) A crane, while moving, from 1 location to another, shall have:

- (a) The boom carried in line with the direction of movement.
- (b) The superstructure secured against rotation, except when negotiating a turn with an operator in the cab or the boom on a dolly.
- (c) An empty hook restrained against movement.

(7) A crane with or without a load shall not travel with the boom at a height that it may bounce back over the cab.

(8) A crane operating at a fixed radius shall have the boom-hoist pawl or other positive locking device engaged.

R 408.11936. Operating near a power line.

Rule 1936. (1) Any overhead wire shall be considered an energized line until a representative of the owner or utility has checked and indicated otherwise.

(2) Before any crane operation is started near a power line the owner or utility representative shall be notified.

(3) Except where electrical power lines and equipment have been deenergized and visibly grounded at the point of work or where an insulating barrier, not a part of the crane has been erected, or the employee is insulated or isolated from the crane, a crane shall maintain clearances in accordance to the following:

<i>Voltage</i>	<i>Clearance Boom Raised</i>	<i>Clearance in transit with Boom Lowered and No. Load</i>
To 50 KV	10 feet	4 feet
Over 50 KV 50 to 345 KV	10 feet + .4 inch per KV	10 feet
346 to 750 KV		16 feet

(4) A cage type boom guard, insulating link or proximity warning device may be used, but their use shall not change the requirement of subrule (3).

R 408.11937. Work platform requirements.

Rule 1937. If a work platform is attached to the loadline of a crawler, locomotive, or truck crane, the employer shall comply with the provisions of construction safety standard Part 10, Lifting and Digging Equipment, being R 408.41001 et seq. of the Michigan Administrative Code.

R 408.11941. Cabs and operating enclosures.

Rule 1941. Clothing, personal belongings, tools and other articles within a cab or operating enclosure shall be stored in cabinets, boxes or other means so as not to interfere with access or operations.

R 408.11942. Fire extinguishers.

Rule 1942. A portable dry powder fire extinguisher with not less than 5 BC rating, or equivalent, shall be kept in the cab, or in the operating enclosure, or on the unit. The operator and maintenance employees shall be trained in its use.

R 408.11943. Refueling.

Rule 1943. (1) A crawler, locomotive, or truck crane fuel tank shall not be refueled while the engine is running.

(2) When refueling is done with portable containers, the containers shall be safety cans having automatic closing caps and be labeled as approved by underwriters' laboratories, inc., factory mutual laboratory, or other nationally recognized laboratory.

(3) Smoking or other sources of sparks and flame shall be not less than 25 feet from a refueling operation.

INSPECTION

R 408.11951. Inspection records and inspector.

Rule 1951. (1) The inspection of a crawler, locomotive or truck crane covered by rules 1952 to 1956 shall be made by an authorized and trained employee or outside service.

(2) Records shall be maintained of inspection results of monthly inspections on brakes, hooks and ropes, and semi-annual inspections of hydraulic relief pressure valves.

R 408.11952. Initial inspections.

Rule 1952. A crawler, locomotive or truck crane shall be inspected prior to initial use and after modification to insure compliance with this part.

R 408.11953. Frequent inspections.

Rule 1953. (1) A crawler, locomotive or truck crane shall be given the following daily to monthly visual inspections:

- (a) Control mechanisms for wear and malfunction, each daily use.
- (b) Deterioration or leakage of air or hydraulic systems, each daily use.
- (c) Hydraulic system for oil level, each daily use.
- (d) Hydraulic hoses and fittings for leaks and deterioration.
- (e) All running ropes, each daily use.
- (f) Lifting hooks for deformation or cracks. A hook having a crack, a throat opening of more than 15% of normal or more than 10 degree twist from the plane of an unbent hook shall be replaced.
- (g) Rope reeving in conformance with the original installation.
- (h) Electrical apparatus for malfunction, wear, dirt and moisture accumulations.
- (i) Tires for specified pressure.

(2) A crawler, locomotive or truck crane shall be given a visual inspection not less than monthly for malfunction of safety devices.

R 408.11954. Periodic inspections.

Rule 1954. A crawler, locomotive or truck crane shall be given the following monthly to yearly inspections:

- (a) Structural members and boom for cracks, deformation and corrosion.
- (b) Bolts and rivets for tightness.
- (c) Sheaves, drums, pins, bearings, shafts, gears, rollers, locking and clamping devices for wear, distortion and cracks.
- (d) Power sources for performance.
- (e) Brake and clutch system parts, linings, pawls and ratchets for excessive wear.
- (f) Load, boom angle and other indicators for

inaccuracies over their full range.

- (g) Travel, steering, braking and locking devices for malfunction.
- (h) Tires for wear or damage.
- (i) Radiators and oil coolers for leakage, blockage of air passages and improper performance.
- (j) Rust on piston rods and control valves.
- (k) Oil strainers and filters for blockage.

R 408.11955 Wire rope inspection.

Rule 1955. (1) Running ropes in continuous service shall have an inspection not less than once a month. The inspection shall include:

- (a) Measurement of diameter of rope.
- (b) Count of broken wires in 1 lay when concentrated.
- (c) End connections for broken wires.
- (d) Corrosion, kinking, crushing, cutting or other conditions affecting the capability of the rope.
- (e) Cracked, bent, worn, corroded or improperly applied end connectors.

(2) For rope in contact with equalizer sheaves or with saddles, or on sheaves where rope travel is limited, the inspection shall include moving the rope from its normal position on the sheave and examining the rope at the rope contact point.

(3) Inspection of a nonrotating type rope shall include the determination that the wires are not broken or worn within the rope.

(4) A rope which has been idle more than 1 month, shall be given a complete inspection prescribed in subrule (1) before being placed in service.

R 408.11956. Occasional and out of service inspections.

Rule 1956. (1) A crawler, locomotive or truck crane which has been idle more than 1 month, but less than 6 months shall receive an inspection as prescribed in rules 1953 and 1955 before being placed in service.

(2) A crawler, locomotive or truck crane, which has been idle more than 6 months, shall receive an inspection as prescribed in rules 1953 or 1954 and 1955 before being placed in service.

(3) A standby crawler, locomotive or truck crane shall be inspected at not less than 6 month intervals as prescribed in subrule (1).

R 408.11957. Tests for crawler, locomotive and truck cranes.

Rule 1957. (1) A crawler, locomotive or truck crane, prior to initial use and after modification, shall be given an operational test to insure compliance with this part, including the following:

- (a) Load hoisting and lowering mechanisms.
- (b) Boom hoisting and lowering mechanisms.
- (c) Travel mechanism.
- (d) Safety devices.
- (e) Boom extension mechanisms for a mobile hydraulic crane.

(2) A test load for a crawler, locomotive or truck crane shall not exceed 110% of the rated load at any working radius.

(3) Results of operational tests and load tests shall be maintained at the job site.

(4) Where rerating is necessary, it shall be as prescribed in Section 5-2.2 of Chapter 5-2 of USAS B30.5-1968, Crawler, Locomotive and Truck Crane standard. Rerating shall not be in excess of the original load rating unless a letter of approval is obtained from the manufacturer and maintained at the job site.

MAINTENANCE

R 408.11971. Maintenance; generally.

Rule 1971. (1) An employer shall establish and maintain a preventative maintenance program under the supervision of an authorized and trained employee or outside service.

(2) Before adjustments and repairs to a crawler, locomotive, or truck crane are started, the following steps shall be taken:

- (a) The crawler, locomotive, or truck crane shall be placed where it does not interfere with other operations.
- (b) A "warning" or "out of order" sign shall be placed at the controls, and the controls shall be in the "off" position. The sign need not be used if the energy source is locked out.
- (c) The power plant shall be disconnected, locked out, or made safe by other means.
- (d) The boom shall be lowered to the ground or otherwise secured against dropping.
- (e) All hydraulic cylinders used for boom hoist and boom telescope on a mobile hydraulic crane shall be retracted.
- (f) Hydraulic oil pressure from all hydraulic circuits shall be relieved before loosening or removing hydraulic components of a mobile hydraulic crane.
- (g) The load block shall be lowered to the ground or otherwise secured against dropping, except when operation is necessary for the adjustment.

(3) After adjustments and repairs have been completed, the crawler, locomotive or truck crane shall not be returned to operations until all guards have been installed, safety devices activated, trapped air removed from the hydraulic system of a mobile hydraulic crane and maintenance equipment and warning signs or out of order signs removed.

(4) Hazardous conditions disclosed by the inspection requirements of rule 1952 to 1956 shall be corrected before operation of the crawler, locomotive or truck crane is resumed.

(5) Adjustments shall be maintained to assure correct functioning of such components as operating mechanisms, safety devices, control systems, power plants, brakes and clutches.

(6) The original safety factor shall be maintained when repairs and replacements are made. Hooks showing defects indicated in rule 1953 shall be replaced. Pitted or burned electrical contacts affecting their operations shall be replaced in sets.

(7) A crane or its wire rope shall not be used as a ground or to carry current. The ground shall be attached to the part being welded while welding.

R 408.11972. Maintenance, wire rope.

Rule 1972. (1) Running wire ropes shall be replaced when they show 6 random broken wires in 1 rope lay or 3 broken wires in 1 strand of a rope lay; wear of $\frac{1}{3}$ of the original diameter of outside individual wires; kinking, crushing or bird caging; heat damage; reduction in nominal diameter of $\frac{3}{64}$ inch for ropes to $\frac{3}{4}$ inch, $\frac{1}{16}$ inch for ropes $\frac{7}{8}$ inch to $1\frac{1}{8}$ inch, $\frac{3}{32}$ inch for ropes $1\frac{1}{4}$ inch to $1\frac{1}{2}$.

(2) A standing wire rope shall be replaced if it has more than 2 broken wires in 1 lay section beyond an end connection or 1 broken wire at an end connection.

(3) A wire rope having more than 1 broken wire at a socketed fitting shall be resocketed.

(4) Wire rope shall be stored in a manner to prevent damage or deterioration and handled in a manner to prevent kinking or twisting.

(5) Before cutting preformed rope, seizing shall be placed on each side of the cut to prevent unlaying of the strands. On nonpreformed rope $\frac{7}{8}$ inch in diameter or smaller, 2 seizings shall be placed on each side of the cut, and for nonpreformed rope more than $\frac{7}{8}$ inch in diameter, 3 seizings on each side shall be used.

(6) During installation, wire rope shall not be dragged in dirt or around sharp objects.